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Patentanmeldung Nr. Patent application No. Demande de brevet n°

01105737.9

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

R C van Dijk

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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Interface module for TV sets

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Description

Interface module for TV sets

EPO - Munich
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The invention relates to an interface module for receiving TV signals.

- 5 A highly integrated television tuner on a single microcircuit is known from US 5,737,035. This circuit receives standard antenna signals and outputs a standard video baseband signal and a standard audio baseband signal. In addition this circuit comprises video and audio processing means and can be controlled by an external computer or controller via a digital serial bus interface.

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It is an object of the invention to modify a tuner for TV sets in such a way that more tasks and functions of a TV set are integrated in one unit to improve the EMC (Electro-Magnetic-Compatibility) performance of the whole TV set. Furthermore it is an object of the invention that all EMC sensitive elements are contained in a shielded module.

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- According to the invention, this object is achieved by means of an interface module for receiving television signals or radio signals comprising several inputs and outputs for receiving and for distributing picture and sound signals as well as control signals and at least one input for antenna signals, the interface module comprising at least one tuner and
- 20 a chip with a microprocessor including memory and means for capturing data and with switching means, with picture,- color- and sound-decoding means and with signal processing means, wherein the chip and the tuner are installed in one common casing.

- The advantage of such an arrangement is that due to the high integration of the module
- 25 and the shielding casing all connections of the different components are very short and completely shielded, which improves the resistance against interference and the EMC performance in general. Therefore electromagnetic influence from outside on the tuner and all other included components and functional groups is reduced to a minimum. The short electrical connections between the chip and the tuner also improve the resistance
- 30 against electromagnetic influence from other TV set components e.g. the CRT. That

means that nearly no additional effort to fulfill EMC requirements is necessary for the TV set in which this kind of interface module is used. Furthermore such an arrangement requires less space on the chassis PCB (Printed Circuit Board) of a TV set than several separate functional groups with additional shielding and other necessary EMC activities.

- 5 Another advantage is that some functions which are cheaper to realize by means of a microprocessor or which have to be changed to fit different TV sets can be transferred to the microprocessor in the chip because the microprocessor makes these functions available anyway. That means that the interface module comprises less elements reducing the manufacturing costs.

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The improvement according to claim 2 has the advantage that the connections between the chip and the tuner are as short as possible which saves significant space on the TV chassis. Moreover cheaper TV set manufacturing is possible because all assembling sensitive components are inside the interface module and do not need to be shielded separately so
15 that the TV chassis manufacturer does not need to use a complicated soldering process.

- If the Printed Circuit Board (PCB) has, according to claim 3, some parts outside the casing which are not covered by the casing then it is possible to provide connecting interfaces on the PCB or other peripheral components like a module for controlling LCD panels on the
20 same PCB as the interface module with the chip and the tuner. If such a control circuit for LCD panels is provided it is a simple task to build a LCD TV set. Then only the interface module and an LCD panel are needed and nothing else. That is an attractive solution for TV set makers.

- 25 According to claim 4 the resistance against electromagnetic influence from outside the casing is significantly improved by using a metallic casing. That makes additional shielding for the video processing means and the microprocessor superfluous.

- With the improvement according to claim 5 the communication between the video
30 processing means and microprocessor on one hand and the tuner on the other hand could be much faster and effective. That feature also is important for the possibility to shift functions from the tuner into the microprocessor part of the IC which means that the

tuner IC only requires a limited number of digital components to perform more complicated functions and tasks such as receiving signals of different TV systems.

According to claims 6 to 8 the whole interface module can easily be updated by means of software. Therefore the tuner is appropriate for different TV sets with different functions and can be configured very flexibly. In this way the tuner can perform more sophisticated functions such as picture in picture, multistandard receiving. If used in cheaper and smaller TV sets less functions are realized. However in both cases the same interface module with a chip and a tuner can be used. That customizing is especially interesting for manufacturers developing TV sets in a wide range of size and prize. It is also possible that a TV set maker adds his own software for a special user interface like a customized On-Screen-Display. This software is then stored in the one time programmable memory part of the micro-processor. That is one possibility to initialize the interface module. Another advantage is that the TV set maker does not have to posses knowledge about RF technique and EMC problems to design a TV set.

The interface module with the integrated tuner and chip according to claims 9 to 11 offers additional possibilities in order to improve the performance of the signal processing. Deviations occurring during the manufacturing process can now be corrected by the interface module itself. The deviation is measured and then the deviation is stored in a correction table. The same can be done to the filters, especially the SAW (Surface Acoustic Wave) filters. It is then possible to measure the strength of the received signal and to adjust the filters and amplifying factors.

Since the interface module according to claims 12 and 13 comprises this microprocessor a much cheaper solution than traditional concepts for antenna diversity which requires more than one tuner or more than one antenna is possible. The interface module is designed in such a way that the tuner part of the module can have, handled by the microprocessor, more than one antenna input. That means that the tuner can switch between TV signals or can switch from receiving TV signals to receiving FM radio signals. For antenna diversity the feature RSSI (Receiver Signal Strength Indicator) is very important. This feature can now be integrated in the interface module.

The interface module according to claim 14 is particularly useful for automotive applications. Since more and more cars are equipped with LCD-Screens for car navigation there is a wish to use the screens for television, too. But the conditions for receiving TV signals are quite bad in moving cars therefore a technique called antenna diversity is often used.

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The invention will be explained in more detail with reference to the drawings, in which

Fig. 1 shows a block diagram of an interface module for TV sets according to the invention with incoming and outgoing signals and the content of the casing comprising the chip and the tuner,

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Fig. 2 shows a block diagram of an interface module for TV sets for receiving stereo audio signals,

15 Fig 3 shows a block diagram of an interface module for LCD TV sets and

Fig. 4 shows a block diagram of an interface module used for TV sets in cars.

Tuner 1 and chip 2 are located in one common casing 3 as shown in Figure 1 and mounted on a PCB (Printed Circuit Board). The casing 3 is preferably made of metal and can have a small hole on top where electrical contacts for programming are available. The chip is a One Chip solution which means that the chip 2 comprises several parts like a microprocessor 4, teletext functions, filters and switches 11, signal processing units 13 and decoders 12 for video, colour and sound signals. Since tuner 1 and chip 2 are arranged in one common casing 3, the required EMC performance, e.g. the resistance against electromagnetic interference from outside the casing 3, is easily to reach and in many respects significantly improved. The various parts within the chip 2 are controlled by the microprocessor 4. Also the tuner 1 which receives one or more antenna signals 5a, 5b is controlled by the microprocessor 4. Therefore it is possible that functions of the tuner 1 are shifted to the microprocessor 4. The tuner 1 is able to receive both analogue TV signals 5a and radio signals 5b, especially FM signals. An advanced version of the tuner 1 is further able to receive digital TV and radio signals. Furthermore the casing 3 offers

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connecting interfaces for a deflection control 8a of a CRT, outputs for RGB signals 10 and at least one output 9 for sound signals which are to be amplified. Also the control of such an amplifier is integrated in the chip 2.

- 5 For processing signals of video recorders or DVD players the interface module has standardised connecting interfaces like SCART 7a, Cinch inputs 7b for picture and sound. Instead of the SCART connector it is also possible to have some Cinch in- and outputs, e.g. for the US area. User interfaces like keyboards 14a and remote control 14 b are also provided.
- 10 A function, which could be also added with the microprocessor 4, is a Receiving Signal Strength Indicator, which could be implemented by an 8 bit ADC available in the microprocessor 4. The microprocessor 4 also allows the use of a 3-wire communication to the tuner part, which would be much faster. Another future function of the interface
- 15 module is automatic alignment of the tuner, which could be also implemented by the microprocessor 4. Automatic alignment offers the possibility for a global tuner design, for all kinds of TV standards. The microprocessor 4 is also able to control the tuning voltage and to store the AGC (Automatic Gain Control) in its memory for faster tuning.
- 20 Provided with two antenna inputs the arrangement is perfect for applications in car systems, which make use of the antenna diversity. If new functions should be added to the tuner 1 and the chip 2, they can easily make available by changing or modifying the software running in the microprocessor 4. So the manufacturer can vary functions just by software upgrades. Certain functions can also be reserved for certain TV sets, although the
- 25 same interface module is used just with different software in the microprocessor 4.

The prototype size of the whole interface module is 114 mm x 48 mm x 14mm. That shows that a very compact size is possible with the integration of the tuner 1 and the chip 2 in one casing. If the PCB of the interface module is a little bit enlarged then also a so-called

30 scaler 8b, which is able to control a LCD panel 15 directly, and a few other components like audio amplifier, EEPROM and voltage regulators can be added to the PCB. For an analogue LCD displays the scaler 8b is not needed. That means that and LCD TV set only

comprises an interface module with the added components and a LCD panel 15. The set maker only needs to connect both parts and install them in a box and the TV set is ready to be sold.

- 5 The interface module according to Figure 2 offers the possibility to process stereo audio signals. Therefore an output for a stereo decoder 9b is provided. The inputs for audio and video signals 7c, 7d are also suitable for stereo audio signals.

- 10 Another interface module is shown in Figure 3, which provides a control unit 8b to control a LCD panel 15. The control unit 8b is a so-called scaler 8b, which is able to control the pixels of the LCD panel 15. The scaler 8b is also mounted on the same PCB as the interface module, but outside the casing 3. For an analogue display the scaler 8b is not needed, in that case the RGB and sync signals are steering the display unit directly.

- 15 The interface module is also applicable to Car-TV. In this case the ability to receive several antenna signals 5a, 5b is particularly important because antenna diversity is often used in Car-TV. Besides the LCD monitor 15 there is an interface for a navigation computer 16. An external input for S-VHS video signals 7e and the opportunity for voice control 19 are provided as well. Some functions of the tuner 1a are shifted to a special car AM-/FM
20 receiver 1b outside the module. In return other functions like the antenna diversity control unit 17 or a low noise amplifier 18 is built in the casing 3. The software functions needed for voice control 19 are implemented by the microprocessor 4 of the chip 2. That means that further functions needed to integrate a cell phone into the arrangement can also
25 implemented by the chip 2.

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Claims:EPO-Munich
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0 8. März 2001

1. An interface module for receiving television signals or radio signals comprising several inputs (7) and outputs (7, 9, 10, 14) for receiving and for distributing picture and sound signals as well as control signals and at least one input for antenna signals (5a), the interface module comprising at least one tuner (1) and a chip (2) with a microprocessor (4)
5 including memory and means for capturing data and with switching means (11), with picture,- color- and sound-decoding means (12) and with signal processing means (13), wherein the chip (2) and the tuner (1) are installed in one common casing (3).
2. An interface module as claimed in claim1,
10 characterized in that the chip (2) and the tuner (1) are mounted on a common circuit board.
3. An interface module as claimed in claim2,
characterized in that the common circuit board comprises further peripheral components
15 and connecting interfaces partly outside the casing (3).
4. An interface module as claimed in claim1,
characterized in that the common casing (3) is made of an electromagnetic shielding
material.
20
5. An interface module as claimed in claim 1,
characterized in that the microprocessor (4) in the chip (2) and the tuner (1) are connected
by a digital signal bus.
- 25

6. An interface module as claimed in claim 3,
characterized in that the microprocessor (4) in the chip (2) is designed to control the tuner
(1) via the digital signal bus and to perform tasks and functions of the tuner (1) by
software means stored in a one-time programmable memory of the microprocessor (4).
- 5
7. An interface module as claimed in claim 6,
characterized in that the interface module is designed to be initialized by software stored in
the one-time programmable memory of the microprocessor (4).
- 10
8. An interface module as claimed in claim 6,
characterized in that the interface module is designed to store a software for a customized
user interface in the one-time programmable memory of the microprocessor (4).
9. An interface module as claimed in claim 6,
- 15
- characterized in that correction parameters obtained by tuner and module alignment and
measurements can be stored in the memory of the microprocessor (4) and that correction
control circuits are provided.
10. An interface module as claimed in claim 6,
- 20
- characterized in that an automatic tracking filter alignment is provided.
11. An interface module as claimed in claim 6,
characterized in that means for variable band switching are provided and that means for
measuring the strength of the received antenna signals (5a, 5b) are provided.
- 25
12. An interface module as claimed in claim 1 or 6,
characterized in that there are provided at least two antenna inputs (5a, 5b).

13. An interface module as claimed in claim 12,
characterized in that there is provided an additional FM radio RF input (5b) possibility
and that the interface module is designed to be able to receive TV and FM radio signals.

- 5 14. An interface module as claimed in claim 1 or 6,
characterized in that there are provided at least two tuners (1) in the casing (3).

Abstract:

Interface module for TV sets

EPO - Munich
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0 8 März 2001

The invention relates to an interface module for receiving television signals and consists of an interface module for receiving television signals or radio signals comprising several

5 inputs (7) and outputs (7, 9, 10, 14) for receiving and for distributing picture and sound signals as well as control signals and at least one input for antenna signals (5a), the interface module comprising at least one tuner (1) and a chip (2) with a microprocessor (4) including memory and means for capturing data and with switching means (11), with

10 picture,- color- and sound-decoding means (12) and with signal processing means (13), wherein the chip (2) and the tuner (1) are installed in one common casing (3).

Fig. 1

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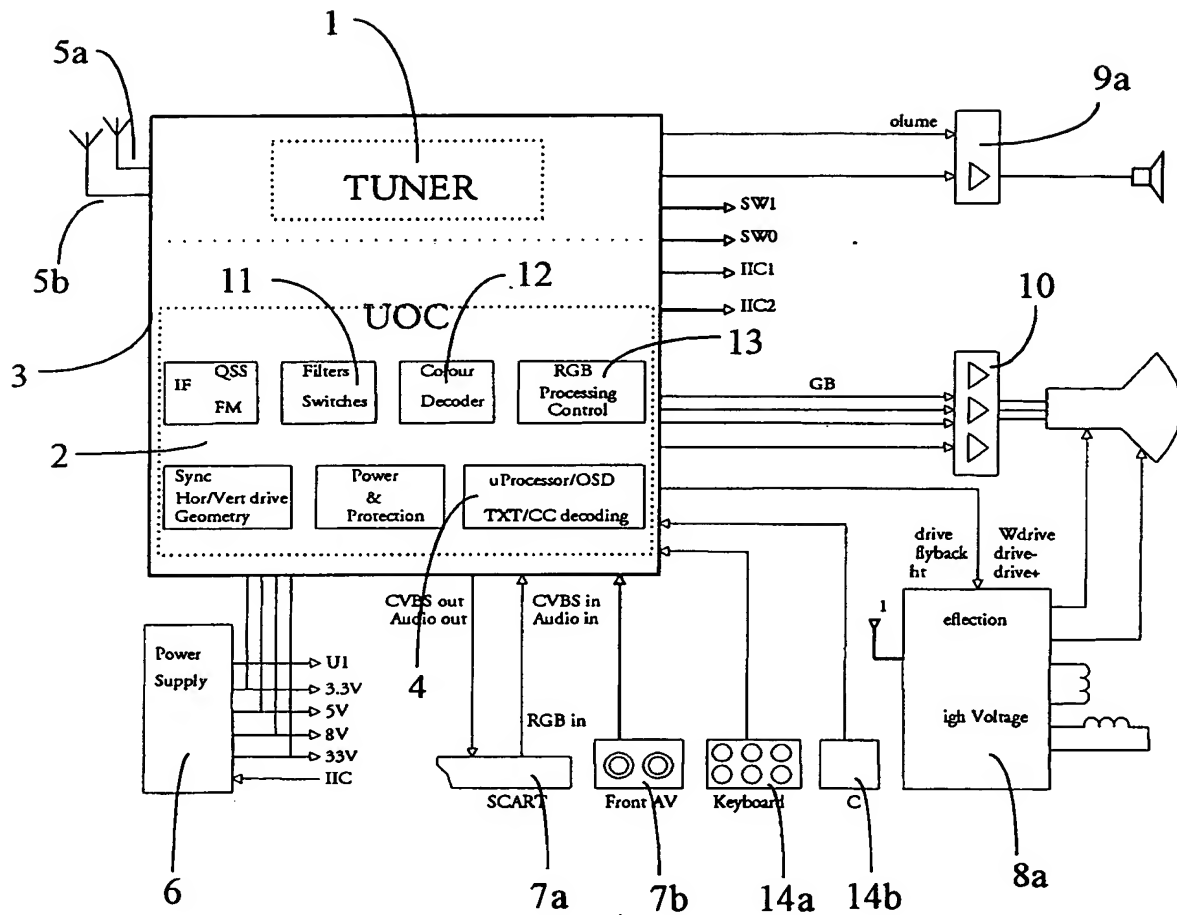


FIG. 1

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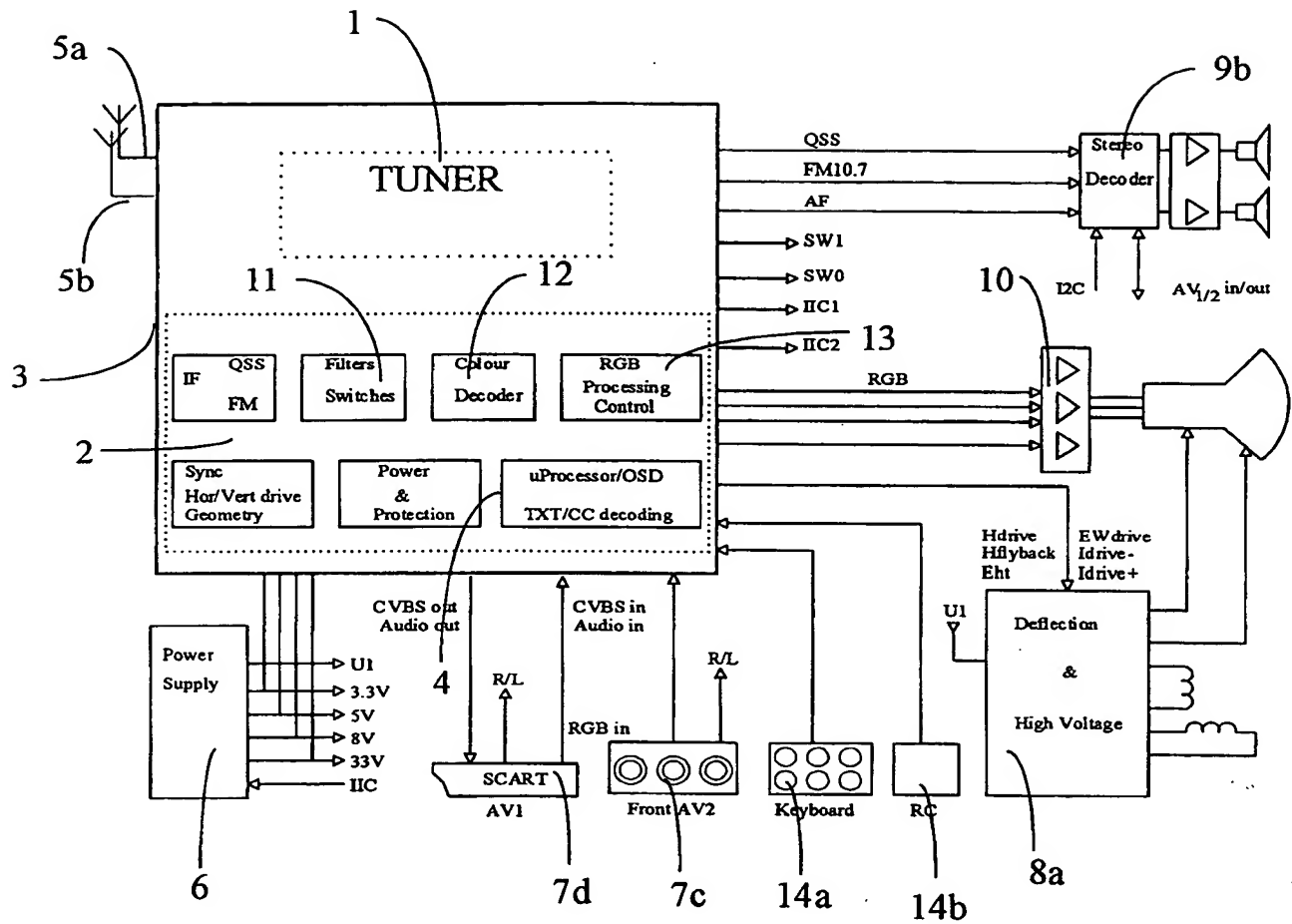


FIG. 2

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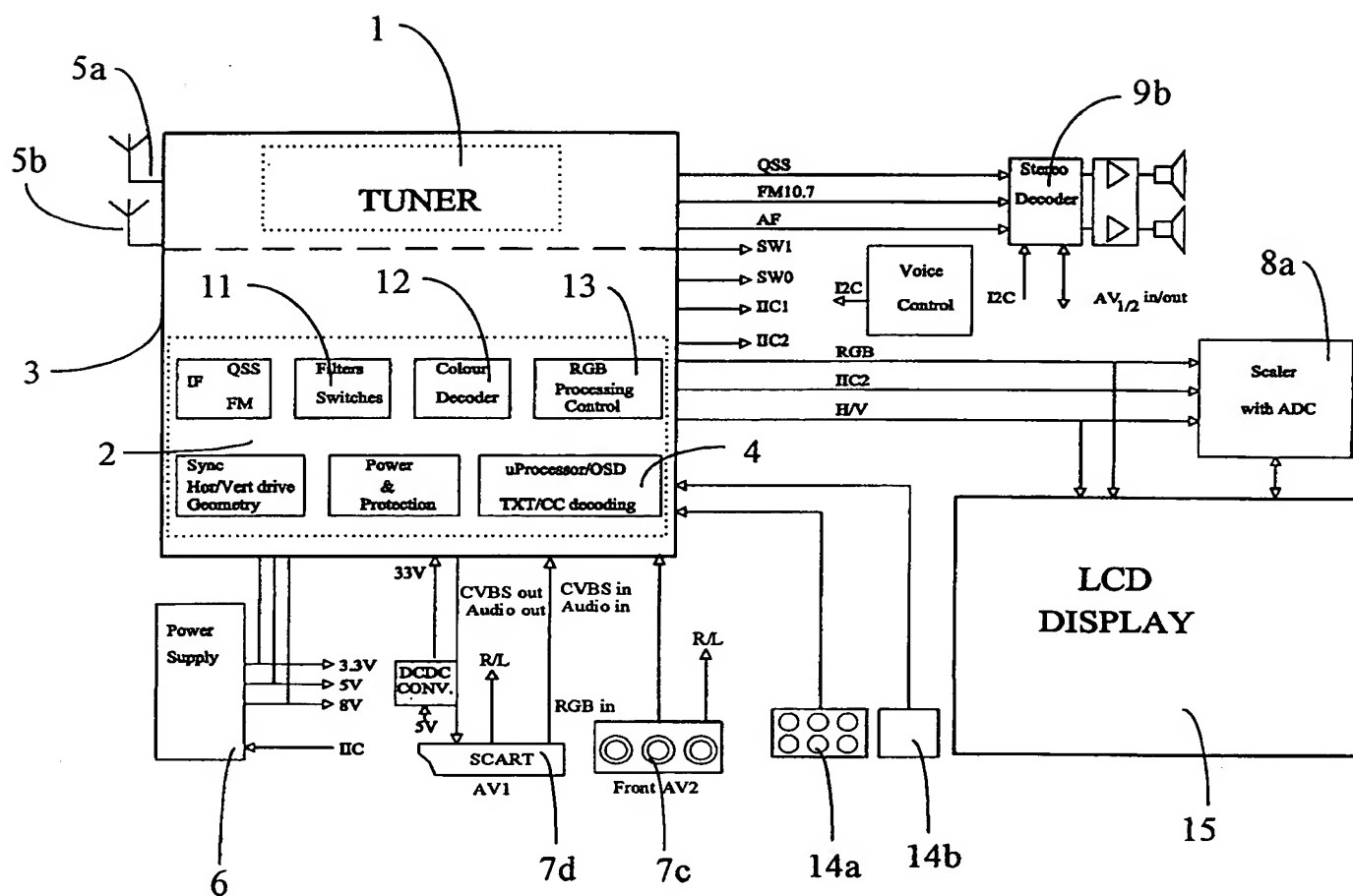


FIG. 3

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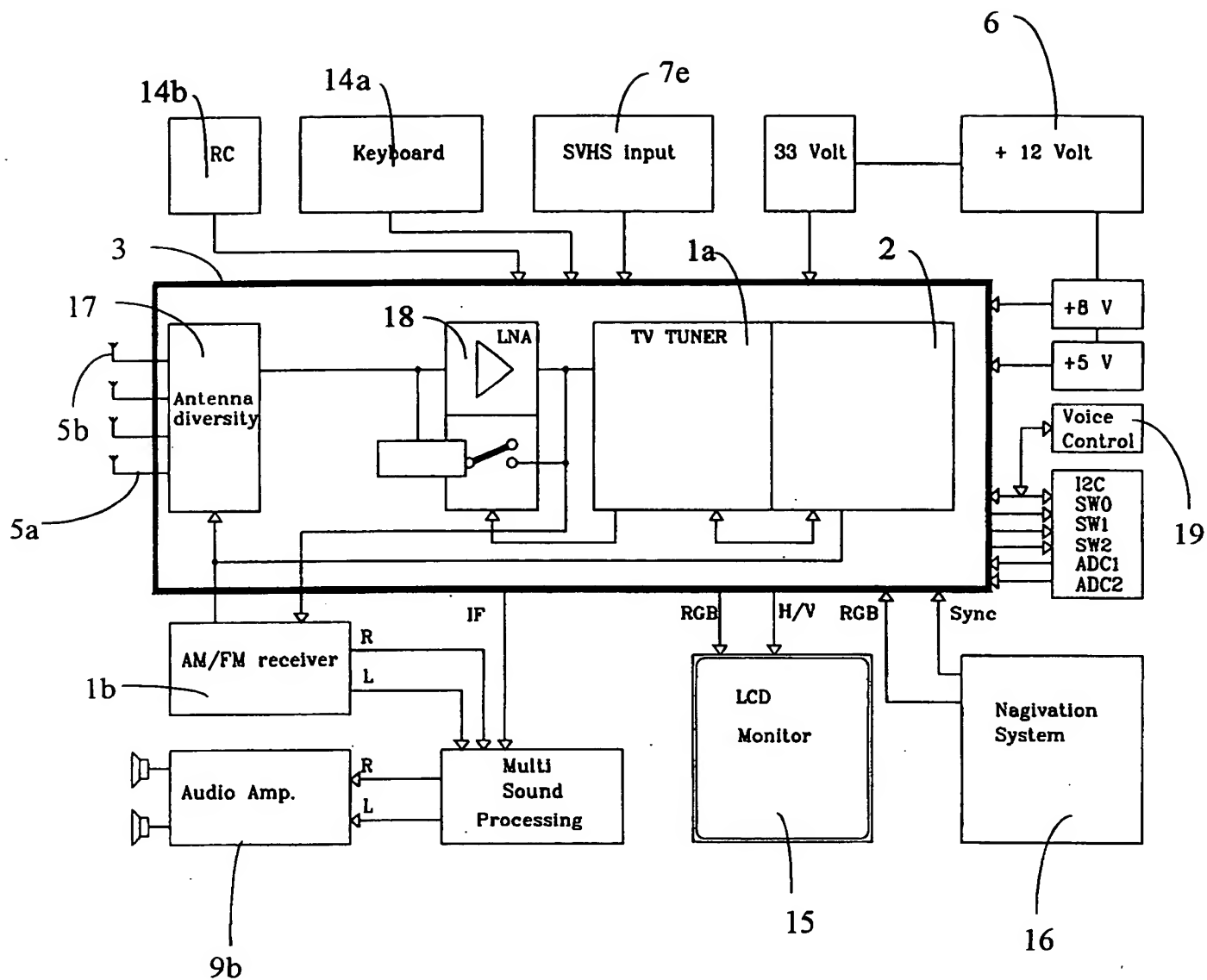


FIG. 4